STATISTICS 2023 **PRINT NAME CLEARLY IN INK** Key

EXAM THREE **SIGNATURE IN INK** _____

SPRING 2012 **CWID IN INK** _____

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TRUE OR FALSE. Answer with a capital T or F. **(3 points each)**

F 1. The p-value of a hypothesis test is the probability that the null hypothesis should not be rejected.

T 2. The standard errors of point estimators increase in magnitude when the sample size decreases.

T 3. A sample statistic is used as a point estimate to estimate a population parameter.

F 4. The center value of a confidence interval is the bound of error for the confidence interval that is used to estimate the parameter of interest.

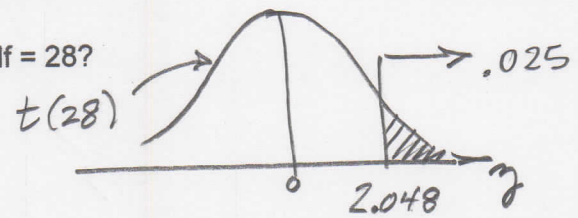
T 5. In a hypothesis test the researcher makes a claim about the value of a population parameter, and then the sample data are used to decide whether the claim should be rejected.

T 6. A confidence interval provides a set of reasonable and plausible values for the parameter being estimated and those values would not be rejected if tested in a two-tail hypothesis test with the same significance level.

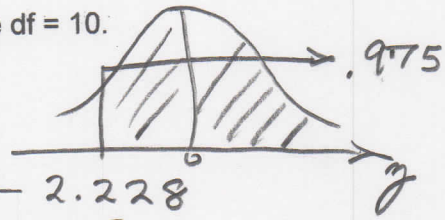
F 7. When the null hypothesis is not rejected then it is concluded that the data in the sample provide evidence in support of the claim stated in the null hypothesis.

t-table Questions. Write your answer on the line. **3 points each)**

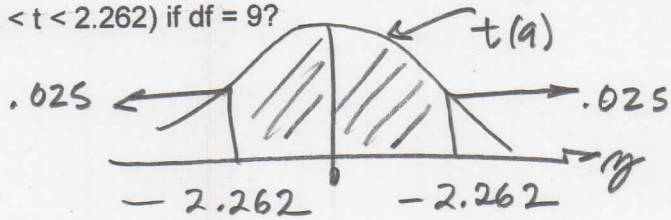
.025 8. What is the P(t > 2.048) if df = 28?



-2.228 9. State the value of t_o, if the P(t > t_o) = .975 and the df = 10.



.95 10. What is the P(- 2.262 < t < 2.262) if df = 9?



STATE THE ANSWER. State the answer on the line given. **(3 points each)**

253.1 11. If a 99% confidence interval to estimate a population mean is (202.3, 303.9) what is the value of the point estimate for the population mean?

$\bar{X}$ is the center of the interval, $\bar{X} = \frac{202.3 + 303.9}{2} = 253.1$

2 12. If a 95% confidence interval based on a large sample to estimate a population mean is (146.08, 153.92) then what is the value of the standard error of the point estimate for the population mean?

$153.92 - 146.08 = 7.84 = \text{width} = 2B = 2\left(z_{\frac{.05}{2}}\right) S_{\bar{x}} \Rightarrow$

$7.84 = 2(1.96) S_{\bar{x}} \Rightarrow S_{\bar{x}} = \frac{7.84}{2(1.96)} = 2$

21 13. How many flights would have to be sampled in order to estimate the average amount of time (in minutes) that a flight is late with a 95% confidence that is 12 minutes wide? Assume the standard deviation of the time a flight is late is 14 minutes.

$n \geq \frac{z_{\alpha/2}^2 \sigma^2}{B^2} = \frac{1.96^2 (14^2)}{6^2} = 20.91 \Rightarrow 21$

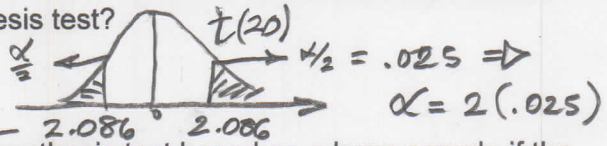
.14 14. What is the point estimate for population proportion if a 96% confidence interval for the proportion of college students who binge drink at least twice per month is (.11, .17)?

$\hat{p}$ is the center of the interval, $\hat{p} = \frac{.11 + .17}{2} = .14$

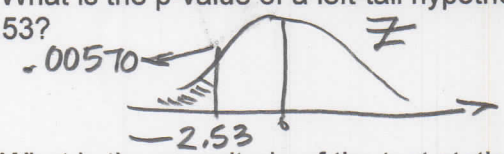
(.3976, .4784) 15. If out of 1000 people surveyed, 438 said they preferred Snickers candy bars to Almond Joy candy bars, what is a 99% confidence interval to estimate the proportion of people who prefer Snickers? Round the bounds of the interval to 4 digits past the decimal.

$\hat{p} \pm z_{\frac{.01}{2}} S_{\hat{p}} \Rightarrow .438 \pm 2.576 \sqrt{\frac{.438(1-.438)}{1000}} \Rightarrow .438 \pm 0.0404$

.05 16. If the rejection region in a two-tail hypothesis test based on a sample with 21 observations drawn from a population whose variance is unknown is below –2.086 and above 2.086 what is the significance level associated with this hypothesis test?

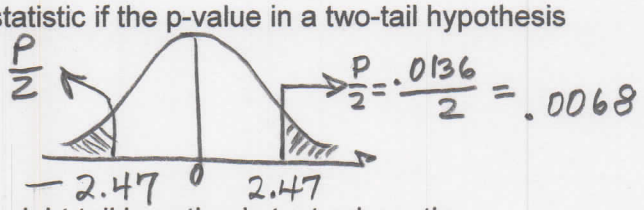


.00570 17. What is the p-value of a left-tail hypothesis test based on a large sample if the test statistic value is -2.53?



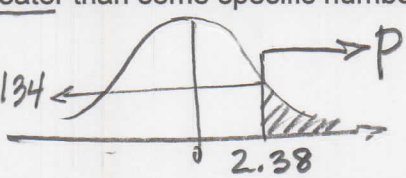
2.47 18. What is the magnitude of the test statistic if the p-value in a two-tail hypothesis test based on a large sample is equal to 0.0136?

Split the p-value between the 2 tails + look up z.



.00866 19. If a z test statistic value is 2.38 in a right tail hypothesis test, where the researcher is attempting to prove that the mean is greater than some specific number, what is the p-value of the test?

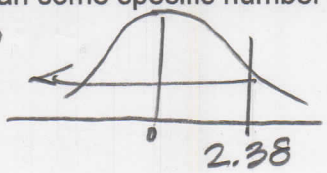
Put 2.38 on Z-table
Look up right tail
from the Z-table → .99134



$P = 1 - .99134 = .00866.$

.99134 20. If a z test statistic value is 2.38 in a left tail hypothesis test where the researcher is attempting to prove that the mean is less than some specific number what is the p-value of the test?

$.99134 = P$



STATE THE ANSWER. Write the answer on the line. **(3 points each)**

A marketing executive at Amazon is interested in estimating the mean number of products that a visitor to the Amazon website views in one visit to the site. Assume that a random sample of 625 visitors to the Amazon site viewed an average of 15.6 products per visit with a standard deviation of 12.5 products. Use this information to answer the next four questions. $n = 625, \bar{X} = 15.6, S = 12.5$

15.6 21. What is the numerical value of the point estimate for the mean number of products viewed in one visit to the Amazon website?

$\bar{x} = \hat{\mu} = 15.6$

.5 22. What is the estimated standard error for the point estimate for the mean number of products viewed in one visit to the Amazon website?

$$S_{\bar{x}} = \frac{S}{\sqrt{n}} = \frac{12.5}{25} = .5$$

1.372 23. Assume that the estimated standard error of the point estimate for the mean number of products viewed in one visit to the Amazon website is 0.7. What is the numerical value of the bound of error for a 95% confidence interval to estimate the mean price of jeans?

Assume $S_{\bar{x}} = .7$

$$B = z_{.05} \cdot S_{\bar{x}} = 1.96(.7) = 1.372$$

2.29 24. If the estimated standard error for the point estimate for the mean number of products viewed in one visit to the Amazon website is 0.7, what is the numerical value of the test statistic to test whether the mean number of products viewed in one visit to the Amazon website 14? Round your answer to two digits past the decimal.

Assume $S_{\bar{x}} = .7$. Test $H_0: \mu = 14$.

$$z_{calc} = \frac{\bar{x} - \mu_0}{S_{\bar{x}}} = \frac{15.6 - 14}{.7} = 2.2857 \Rightarrow 2.29$$

During a recent election for a county commissioner, Candidate Jones was elected commissioner with 1,523 votes, only 12 votes more than his opponent. Four-hundred students were questioned if they thought that there should have been a recount of votes for the commissioner race. Two-hundred and forty students said that they thought there should have been a recount. Use this information to answer the remaining questions on this page.

.6 25. Based on this sample what is the numerical value of the point estimate for the proportion of students who thought that there should have been a recount?

$$\hat{p} = \frac{x}{n} = \frac{240}{400} = .6$$

.0245 26. What is the numerical value of the estimated standard error for the point estimate for the proportion of students who thought that there should have been a recount? Round the answer to four digits past the decimal.

$$S_{\hat{p}} = \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = \sqrt{\frac{.6(1-.6)}{400}} = .0245$$

4 27. Assume that the estimated standard error for the point estimate for the proportion of students who thought that there should be a recount is 0.0125. What is the numerical value of the test statistic to test the hypothesis that 55% of students thought that there should have been a recount?

Assume $S_{\hat{p}} = .0125$. Test $H_0: p = .55$

$$z_{calc} = \frac{\hat{p} - p_0}{S_{\hat{p}}} = \frac{.6 - .55}{.0125} = 4$$

STATE THE ANSWER. Write the answer on the line. **(3 points each)**

A new type of mp3 player is advertised to copy a CD in less than 15 seconds on average. In order to test this claim a consumer advocacy agency copied 25 CD's to this new type of mp3 player. The average copy time from the sample of 25 is 14.8 seconds with a standard deviation of .25 seconds. Use this data as a random sample to answer the questions on this page. $n=25$, $\bar{X}=14.8$, $S=.25$

$H_A: \mu < 15$ 28. State the appropriate alternative hypothesis if the research question is, "Do these 25 copied CD's provide evidence that the mean time to copy is less than 15 seconds?"

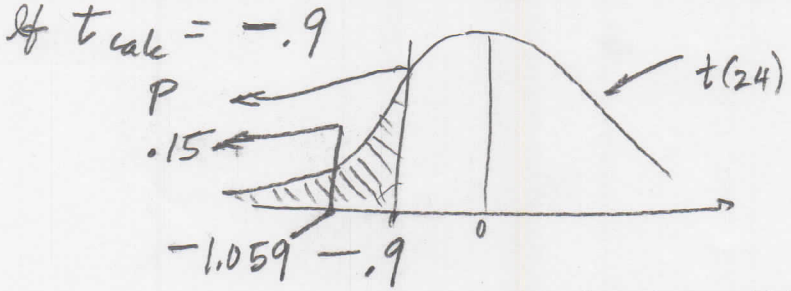
-4 29. What is the numerical value of the test statistic to test the null hypothesis that the mean time to copy a CD to this new type of mp3 player is equal to 15 seconds?

$$t_{calc} = \frac{\bar{X}-M_0}{S_{\bar{X}}} = \frac{14.8-15}{\frac{.25}{\sqrt{25}}} = \frac{-.2}{.05} = -4$$

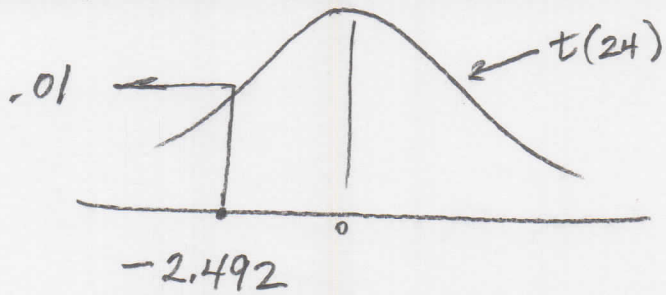
$t(24)$ 30. What is the name of the distribution of the test statistic, if in fact the mean time to copy a CD to this new type of mp3 player is equal to 15 seconds?

$t_{calc} \sim t(n-1) \equiv t(24)$ if $H_0: \mu = 15$ is true.

.15 31. If the numerical value of the test statistic in this case was -.9 then the p-value of this hypothesis test would be greater than what amount based on the t table provided with the exam?



-2.492 32. If the researcher performing this hypothesis test cannot tolerate more than 1% chance of rejecting a true null hypothesis, then the test statistic must be less than what value in order to reject the null hypothesis?



No 33. If the p-value of this hypothesis test is equal to .2653 and the significance level chosen by the researcher is 0.05 should the conclusion be that the mean time to copy a CD to the new type of mp3 player is less than 15 seconds? Answer YES or NO.

$p = .2653 > .05 = \alpha \Rightarrow$ Do not Reject H_0. $\Rightarrow$

Data do not support $H_A: \mu < 15 \Rightarrow$ No